

Abstract Submitted
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Stability of a helical vortex tube with axial flow YUJI HATTORI, IFS, Tohoku University, YASUHIDE FUKUMOTO, IMI, Kyushu University — The stability of a helical vortex tube with axial flow is studied analytically. The base flow is obtained by solving the Euler equation perturbatively assuming small ratio of core to curvature radius, which is denoted by ε , and Rankine vortex with uniform axial flow at the leading order. We apply both local and modal stability analysis. By local stability analysis we show that the flow is subject to not only curvature instability but also Coriolis instability, both having the same resonance condition. The unstable growth rate is $O(\varepsilon)$ and given by the magnitude of a sum of the complex numbers corresponding to the two instabilities. Combined effects of the axial flow and the torsion of the helical vortex tube appear as $O(\varepsilon^2)$ modification. These results are confirmed by the modal stability analysis.

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